AGRICULTURAL Research

U.S. DEPARTMENT OF AGRICULTURE

JULY 1972

AGRICULTURAL
Research

July 1972/Vol. 21, No. 1

The Healing Green

Even before the dawning of history primitive man turned to the plant kingdom to balm his hurts and cure his ills. This alliance endured over the centuries so that mankind has fashioned a vast and global body of lore on the use of plants that heal. Much of this lore, of course, incorporates error and superstition although there were and are medicinal plants of solid merit. Indeed, as recently as the early 1900's, before the era of synthetic drugs, 80 percent of all medicines were obtained from leaves and barks and roots. As the century progressed, however, drugs made from botanical materials were eclipsed by those synthesized in the laboratories of the organic chemist.

The onset of World War II cut off many of the drug industry's vital imports. Plant explorers were forced to search for substitutes at home and in accessible countries. Their successes included South American bark substitutes for quinine from Java, and an Australian tree which yielded alkaloids formerly obtained only from European belladonna. This gave impetus to a botanical renaissance that is still flourishing. For the plant kingdom with its more than 350,000 flowering species is a largely untapped resource in humanity's endless war on disease. Ironically, in this era of sophisticated science and technology, chemical analyses have been run on relatively few wild plants, whether from faraway jungles or nearby vacant lots and roadsides. In recent years a concerted drive has been underway to find and investigate new medicinal plants. Some serve as factories of nature, others are molecular models for synthesis, still others help stimulate basic research.

A vital part of this quest is aimed at finding new botanical drugs for treating cancer. ARS joined this worldwide effort more than a decade ago; while its plant explorers have been busy combing the United States, they have also repeatedly worked the rich plantlife of Africa. Although most of the plants are collected in their habitats, some are bought at the little native markets that dot the countryside. Each plant that is collected is documented with a pressed and dried herbarium specimen. ARS plant explorers have collected some 20,000 species so far for medical science to screen in hope of detecting and isolating chemical substances with anticancer properties. Of the collections made in the global program, 1,500 species have shown promise for cancer therapy; a few are being readied for testing of human patients.

The science of chemurgic investigation of uncultivated plants is still a tottering infant. Despite years of activity, science has barely explored the potential of green medicine for relieving pain and saving lives.

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COVER: Dr. William G. Knibbe compares two beakers of water. The one in his right hand is effluent taken directly from sprayer. The beaker in his left hand contains water taken from 24 inches under the spray area. This water is clean, desirable, and no longer a pollutant (0971X1203–5). See page 8.

AGRICULTURAL RESEARCH is published monthly by the Agricultural Research Service (ARS), U.S. Department of Agriculture, Washington, D.C. 20250. Printing approved by the Bureau of the Budget, June 1967. Yearly subscription rate is $1.50 in the United States and countries of the Postal Union, $2.00 elsewhere. Single copies are 15 cents. Send subscription orders to Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Use of commercial names and brands is for identification only and does not imply endorsement or approval by USDA or ARS.

Earl L. Butz, Secretary
U.S. Department of Agriculture

Talcott W. Edminster, Administrator
Agricultural Research Service

...is soap on the way BACK?

DETERGENTS have been known to make environmentalists whiter than white—with rage. It used to be said that detergents caused foaming in streams, until the biodegradable (LAS) compounds were developed. More recently, spent detergents were cited for eutrophication of our lakes. Some manufacturers removed the phosphates that were being accused of promoting the growth of algae to rob the water of its oxygen. They substituted carbonate, and the carbonate was declared a health hazard.

Many ask, "Why don't we just forget the whole thing and go back to good old soap?" ARS scientists have shown how we may be able to do just that, at least in part.

Soap is a detergent, too—and a good

one at that. It's the best soft-water detergent there is. In hard water, however, it forms a curd or scum—the familiar "ring around the bathtub." In the laundry, this curd is often deposited on the clothes, making them come out looking less than white and bright.

Ever since synthetic detergents, which are based mainly upon petroleum, took over most of the soap market, scientists at the Eastern marketing and nutrition laboratory in Philadelphia, Pa., have been seeking alternate uses for animal fats (tallow). One of their early approaches was to make synthetic detergents from tallow. Results were technically successful, but not commercially so, because tallow-based products were more expensive to make than the commercial detergents.

Recently, ARS chemists Warner M. Linfield, Raymond G. Bistline, James K. Weil, and William R. Noble have tried a new approach at the Philadelphia laboratory. Instead of making a new detergent, they took plain soap and added a fat-based compound to it that would prevent the hard-water curd (lime soap) from forming by keeping it in dispersion. A number of derivatives of fatty acids, alcohols, and amines were found to be effective.

Soap containing 10 or 20 percent of a lime-soap dispersing agent turned out to be a good detergent in hard water. To make it as efficient as the best detergents, however, it needed something more. So the chemists replaced some of the lime-soap dispersing agent with what detergent makers refer to as a builder. They found nontoxic and nonpolluting compounds like citrate and silicate made excellent builders.

They conducted washing tests with these formulations in hard water (300 parts per million calcium carbonate), using different amounts of each of the two additives from 0 to 50 percent. The tests showed that 65–15–20 formulations of soap, lime-soap dispersing agent, and builder gave best results.

Then the ARS chemists used 15 of their best formulations (including a few without the builder) in hard water to wash swatches of fabric soiled in the laboratory with vacuum cleaner sweepings. After six soiling and washing cycles, they determined photometrically how much in reflectance the fabrics had lost from their unsoiled state. The scientists also put clean samples in the washing machine along with the soiled ones to determine how much dirt was deposited on the clean fabric. In these tests all the soap formulations were better than plain soap and also better than a phosphate-built LAS detergent.

As a final test, swatches of standard soiled fabric were washed with soap combinations containing methyl esters of alpha-sulfo fatty acids as the lime-soap dispersing agent and sodium silicate as the builder. For comparison, a well-known heavy-duty granular detergent was used. Soap formulations were all equal or superior to the detergent in water of 50 and 150 parts per million of hardness, and they compared favorably with the detergent when water hardness was 300 ppm.

Announcement of these findings has encouraged the detergent industry to consider the ARS soap formulations seriously as replacements for the present compositions. Since the modified soaps appear to be completely biodegradable, contain no substances known to be harmful to health or to the environment, and are made from animal fats, an abundant and renewable natural material, their ultimate commercialization is a distinct possibility □

High hopes for Puerto Rican soybeans

It's possible to produce three crops of soybeans with combined yields of some 9,000 pounds per acre—more than 150 bushels—yearly in Puerto Rico. At present, however, the island imports all of the soybeans it consumes. Success of a three-crop system will depend upon intense management and adherence to planting date and plant population schedules.

ARS scientists at the Puerto Rico Agricultural Experiment Station, Rio Piedras, using Hardee variety soybeans found that from mid-February to mid-September they can get two crops, each yielding 40 to 60 bushels per acre. The crops were planted 90,000 plants per acre—20-inch rows with 3½ inches between plants.

A third crop can be squeezed in during winter months when yields are usually low by increasing populations to about 220,000 plants per acre—5-inch row, 5 inches between plants. That crop yields about 50 bushels per acre because of the higher plant population even though the individual plant production decreases.

Only 70 to 90 days are required to produce a crop during the winter months compared to 110 to 130 days for plantings made the rest of the year.

Research plots were located at the Corozal substation at an elevation of 700 feet with temperatures ranging from 64° F. to 89° F. The soil is deep, red Corozal clay with a pH of about 5.0 limed to 6.0. Plots received 100 pounds of phosphate, 100 pounds of potassium, and 50 pounds of magnesium per acre in one banded application 2 weeks after planting.

Irrigation was applied to supply at least 1½ inches of water weekly, including rainfall. Plots were sprayed to control insects and diseases.

Protein content of the beans ranged from 40 to 44 percent, and oil content was 20 to 23 percent. Neither protein nor oil content was affected by the spacing or season of the year. Nine thousand pounds of the soybeans contain about 2,000 pounds of oil and 3,800 pounds of good quality dry protein.

These figures contrast with about 250 pounds of dry protein per acre being produced yearly by cattle grazing intensively managed pastures in Puerto Rico (AGR. RES. Sept. 1971, p. 11). However, cattle can be effective protein producers on steep lands requiring the protection against erosion afforded by grasses.

Mountain pastures would be a means of releasing some of the coastal lands for mechanized crop production such as soybeans while getting maximum use out of steep slopes.

ARS soil scientists Fernando Abruna and José Vicente-Chandler and technician Servando Silva believe these data show the great potential for producing high yields of soybeans under tropical conditions, to help correct widespread dietary protein deficiencies in the tropics. □

Right: *ARS entomologist Harry G. Davis adds about ½ fluid ounce of attractant to container, which will be covered with cone-shaped screen in his left hand. Wasps crawl through small opening in narrow end of cone and are unable to find their way out, thus die of starvation (0871K1040–2).* **Center:** *Yellow jacket traps mounted on 48-inch broom handles around perimeter of peach orchard produced a pronounced relief from wasps within 2 or 3 days after the traps were put in operation (0871K1028–28).* **Below right:** *Every fifth day, Dr. Davis collected wasps from the traps and replenished the attractant (0871K1039–22).*

Sweet Smells lure Yellow

An experimental new lure controls yellow jackets and related *Vespula* wasps without contributing to environmental pollution.

Frequently, yellow jacket wasps are more than a backyard nuisance. They impede harvesting of fruit in orchards and are troublesome at mink ranches and in beeyards. Wasp stings are lethal to some people, and may cause allergies to appear unexpectedly in others.

ARS scientists have screened more than 500 experimental lures for their effectiveness as attractants for the pests. The most promising materials, synthesized and selected by ARS chemists Terrence P. McGovern and Morton Beroza at Beltsville, Md., are being evaluated by ARS entomologists Harry G. Davis and William M. Rogoff at Fresno, Calif., and in Oregon and Washington.

One of these materials, octyl butyrate, is a pleasant-smelling ester which is an ingredient in synthetic fruit flavorings used in some soft drinks, candies, and baked goods. The lure attracted nearly 200,000 yellow jackets in trapping tests made in a 22-acre orchard in Oregon by Dr. Davis and Robert W. Zwick, entomologist of the Oregon State University Mid-Columbia Experiment Station, Hood River.

The lure brought a fast response by the wasps during the 3-week tests. Within 4 days, the pests were no longer troublesome in the orchard and in the first 10 days, the traps had captured 130,000 of the 200,000 wasps counted by the end of the test.

The scientists found that the lure did not attract honey bees or other beneficial insects, wildlife which might destroy the traps, or other insect species which might have interfered with the efficiency of the traps in capturing the wasps.

The lure, and a trap designed at Fresno, are inexpensive, costing about 35 cents per loaded trap. Dr. Davis and Dr. Zwick prepared the traps by saturating cotton balls with the lure

Jackets

and—in one series of tests—placed them in cardboard ice cream cartons fitted with cone-shaped screens. The insects entered the cartons through the cones, but could not find their way out, and died.

The entomologists attached 114 of the traps to posts placed about 30 feet apart around the periphery of the orchard. Good results were also obtained in later tests with ½-gallon plastic tub traps set 60 feet apart.

Further tests will be made to determine the most effective type of trap and the optimum amount of lure needed, as well as to explore the potential of other lures. □

Below: *Effluent from food processing plant is filtered; the solid waste is used as feed for livestock and the water is used to irrigate grazing pastures (0971X1202–6).* **Above:** *Dr. William K. Knibbe (right) and Dr. Richard E. Fowler (left) examine grass samples from the irrigated field. The samples are dried, weighed, and then evaluated for total yield and nutritional quality (0971X1202–4).*

Feed fro

IRRIGATING GRASS FIELDS with effluents from food-processing plants is one way of recycling waste water without polluting the environment. Can these fields also be used for growing lush grass to feed cattle or sheep?

Studies are underway at a commercial vegetable cannery to find out. Traditionally, fields sprayed with effluent are taken out of production. This frequently results in the allocation of too little land for the amount of waste water to be treated.

Too much water or too little land causes failure of the system and leads to runoff and stream pollution. Turning these waste disposal fields into irrigated pastures provides the processor an incentive to allocate sufficient land for treating the effluent adequately while at

Center: *This field has been oversprayed with plant effluent (0971X1204–7).* **Below left:** *William L. Sahler, hydrologic technician, uses an ordinary rain gage to measure the water depth (0971X1203–15).* **Below center:** *Mr. Sahler (rear) measures soil moisture content with a neutron probe while Steve Isaacs, Delaware Agricultural Experiment Station, takes a reading from a scaler to determine how far down the water is moving (0971X1203–18).* **Below right:** *Chemist Don Mitchell takes a well water sample to determine how efficiently the soil removes impurities from the water (0971X1203–26).*

n water wastes

the same time preventing further pollution of our lakes and streams.

ARS scientists are conducting the studies in cooperation with the Delaware Agricultural Experiment Station, Newark; the Sussex Soil and Water Conservation District, Georgetown, Del.; and the Virginia Truck and Ornamentals Research Station, Norfolk.

The Delaware cannery under study removes the solid wastes from the water at the plant and trucks them away for use as animal feed. The liquid is piped and sprayed on nearby fields by a rotating boom sprayer that covers 13 acres in one complete sweep. Alternate plots are sprayed so that one can be drying out while the others are being irrigated. To prevent trampling of the sod and compaction of the soil the cattle are also alternated so that they are grazing on the plots that are drying out.

Livestock pastured on the study plots have shown good gains in weight. These gains will offset much, if not all, of the expense of installing the system.

Moreover, scientists using a wide range of instruments to monitor the area find, among other things, that the water is clear, clean, and drinkable after passing through 12 inches of soil.

The success of an irrigated pasture is dependent upon good management—good management of the grass, the soil, the irrigation water, and the livestock. Runoff and the pollution of surface and ground waters can be eliminated.

While a great deal has been learned, research continues in an effort to further define "good management." □

Water reported safe for irrigation purposes is that used in the processing of green beans, squash, tomatoes, corn, steam-peeled potatoes, and poultry. Waste water from pea and lima bean processing may be suitable from some canneries but may need special attention from others because of excessively high concentrations of sodium and chloride.

Waste water from lye-peel potato processing is not suitable for irrigation because of the extremely high concentration of sodium hydroxide. It should probably be segregated for special treatment.

Studying the Staff of Life

HOW MILLING CHANGES the nutrient composition of wheat has been determined in a series of ARS-sponsored studies.

In eight investigations, scientists at the American Institute of Baking and the Purdue Research Foundation of Purdue University cooperated with ARS scientists in analyzing the composition of three types of wheat grains, flours from these grains, typical baked products made from flours, and 10 types of wheat food products.

Consumer foods analyzed included all-purpose flour, biscuit mix, enriched white breads (made by continuous-mix and conventional sponge-dough procedures), uncooked wheat cereal, wheat flakes cereal, shredded wheat, whole wheat bread, hamburger rolls, and cake-type doughnuts. Altogether, 156 samples of wheat, flour, wheat products made with the flours, and consumer products were studied.

Results of these studies show:

- One-fifth more starch in the flours than in the whole grain wheat.
- Vitamins and fatty acids always decrease when grain is milled.
- Unsaturated fatty acids include linoleic acid as the largest constituent of the fatty acids of wheats and flours.
- The amino acids, glutamic acid and proline, are always higher in the flours than in the whole wheats.
- With the addition of recipe ingredients, products made with the flours gain in vitamins, mineral elements, and fatty acids. (Information on Vitamin E and the B-vitamins was reported earlier—AGR. RES., Sept. 1970, p. 14.)

Increased constituents in flours compared with the wheats from which they were prepared indicate additions from another source or changes caused by processing or preparation, or both. Similar wheat products from different geographic areas show no significant differences in nutrient content.

With regard to protein, fat, and ash, durum showed a somewhat greater content of these nutrients than other wheats. All flours had smaller amounts than their respective whole wheats. The composition of products made from flours (breads, cakes, crackers, and macaroni) depended on the recipe ingredients. Breads made by conventional and continuous mix procedures did not appear greatly different.

A relatively large amount of linoleic acid was found in the fatty acids of wheat. Analysis of the flours also showed linoleic to be the major fatty acid constituent. In bread, cake, and crackers, relationships were altered by the addition of shortening. The unsaturated fatty acid content of the product was largely dependent on the linoleic acid constituent.

When it came to milling wheat to flour and producing typical products from each flour, scientists found no significant difference among the wheats in any of the carbohydrate constituents, except starch. When the four types of flour were milled from the three types of wheat, decreases in simple and complex sugars and increases in starch occurred in all the flours. Only products containing whole wheat or its fractions contained carbohydrates other than starch and sugars.

Soft wheat rated highest in starch content and durum wheat the lowest. Analysis showed considerable simple sugar, such as dextrose, and not much complex sugar, such as sucrose, in the wheat products. Variation in the complex sugar content of the wheats was greater than in the other carbohydrate fractions. Wheat flakes cereal was higher in both simple and complex

sugar content and lower in starch, pentosan (a gum), and fiber fraction content than were the other cereals.

Flours retained most of the 18 amino acids studied. In every case, the flours were higher than the wheats in glutamic acid and proline. Cystine and methionine content each totaled more than 90 percent that of the whole wheat. Bread was somewhat higher in lysine, probably due to the addition of milk solids. The greatest amino acid decreases were for methionine and arginine, in crackers.

All wheats were similar in content when it came to mineral elements analyzed. Principal elements found in whole wheat grain were potassium, phosphorus, magnesium, and calcium, in that order. More lead, tin, chromium, cadmium, and sodium were retained by the flour than by other milling fractions. Recipe ingredients contributed to the mineral elements found in wheat products other than flour. The mineral content of consumer products averaged from 95 to 148 percent that of wheat, except in the case of all-purpose flour and doughnuts. Their mineral content averaged 49 and 78 percent of the amounts in wheat. □

TLC keeps citrus safe to eat

AMERICANS are a citrus fruit-eating people. They consume almost 5.7 billion pounds annually. To continue this nutritional indulgence, fruit losses must be kept minimal. Thin-layer chromatography (TLC) abets this task.

Fungicides are principal weapons used to combat crop decay. To insure public safety and maintain effective packinghouse treatment, fungicide application must be carefully and constantly scrutinized. TLC analyzes thiabendazole, a postharvest fungicide added to the wax sprayed on citrus fruits, more quickly and accurately than conventional methods.

Official residue tolerance of thiabendazole is 2 parts per million (ppm.) in or on fresh citrus and 8 p.p.m. in or on dried citrus pulp used as cattle feed. However, a temporary tolerance of 6 p.p.m. in or on fresh citrus is permitted by the Food and Drug Administration during long periods of storage or shipping. It is important that the thiabendazole residue does not exceed legally allowed levels.

The analysis method most often used involves surface stripping of whole citrus fruit with ethyl acetate to remove thiabendazole from the surface or ethyl acetate extraction of thiabendazole from a water suspension of ground, whole fruit. Spectrophotofluorometry determines the thiabendazole content. However, the occasional presence of certain citrus constituents interferes with the fluorometric readings.

ARS food technologist Shirley M. Norman, plant physiologist Charles C. Craft, and technician David C. Fouse, Pomona, Calif., developed a TLC method that eliminates interference by citrus constituents. TLC completely separates thiabendazole from the problem-causing constituents.

Whole-fruit blends, juice, oil, or dried citrus pulp are extracted with ethyl acetate, partitioned into a weak acid, then partitioned into ethyl acetate-chloroform. Thiabendazole is then separated from the citrus constituents on a TLC sheet. Thiabendazole is extracted from the sheet, and the fluorescence intensity is compared with standards similarly chromatogrammed and measured.

The TLC method accurately determines thiabendazole content ranging from 0.2 to 6.0 ppm. Thiabendazole recoveries from samples are high, ranging from 95 to 99 percent for surface strippings and 70 to 91 percent for rind and pulp extractions.

Residue values obtained by the TLC technique compare favorably with those obtained with conventional methods. Test time required is shortened for surface residues and is approximately the same for whole-fruit residues, but more samples can be completed during the same time period using the TLC method. □

Barley Color... Nature's Lie Detector

BETTER BEER on tap for imbibers? A recent study shows that colorimeters can accurately and objectively evaluate barley quality, bringing to the market for the first time a reproducible grading standard.

Maltsters desire bright, light yellow barley. Dark or stained grain indicates that the barley was harvested during wet weather, which frequently leaves germination incomplete. Discolored barley often develops undesirable flavors and odors when malted.

Color judgment has long been the most common and easiest method of barley quality evaluation. Trained judges examine a kernel sample and assign a color score ranging from 2 for a bright, light grain to 9 for a very dark or stained grain. A standard barley sample is included in each group of samples to serve as a reference and provide some continuity in the week-to-week color determinations.

With the increasing quantity of barley needing examination and the demand for standardized test scores, an objective method of color measurement has become very desirable. People are subject to fatigue leading to judgment errors. Machines avoid this weakness. Also, mechanical judgments are reproducible, allowing agreement on color score between grain buyers and sellers, laboratories, and industry.

ARS chemist Clifford A. Watson, Manhattan, Kans., working with cereal chemists Sandra K. Skarsaune and Orville J. Banasik, North Dakota Agricultural Experiment Station, Fargo, investigated three commercial colorimeters to determine the feasibility of objective color scoring and to investigate factors influencing barley color scores.

Two of the machines used three values to describe barley color: *L*, measuring light reflectance of the barley; *a*, measuring the amount of red or green in the barley; and *b*, measuring the barley's blue or yellow content. The third machine measured only the lightness of each barley sample. Explored factors influencing color judgments included crop year (year when sample was harvested), variety, and growth location.

Crop year had no significant effect on kernel color judgment in the study—although it would in crop years with adverse weather conditions. Variety affected a machine's measure of redness when blue and white aleurone barleys were included in the tested samples. Location of growth affected *L* and yellowness readings.

When mechanically measuring color, the study's findings indicate that excluding *a* from the readings produces the best correlation between mechanical and visual scores. □

Elm trees branch out

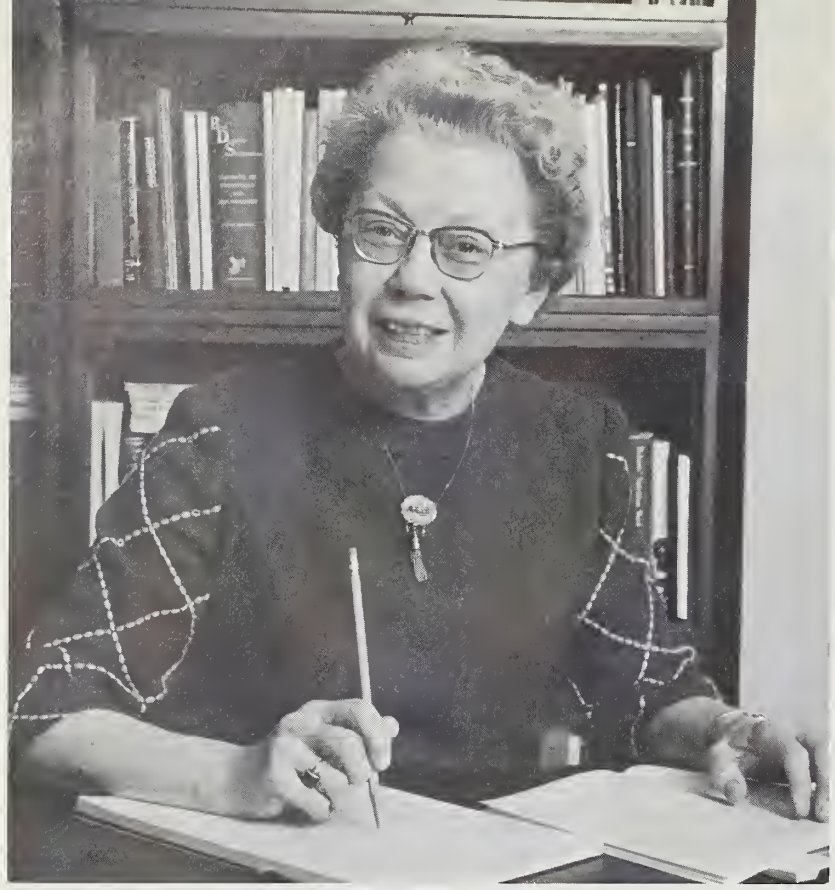
ELMS have been successfully propagated by a modified twig grafting method developed for finely branching hardwood trees that do not lend themselves to common budding techniques.

Budding is a rapid propagating technique commonly used in vegetative reproduction of many fruit and ornamental trees. Elms and other finely branched trees, however, may not have buds of sufficient size for successful budding.

Twig grafting, in which a short twig is substituted for a bud, was successfully demonstrated on several species of elms by pathologist Lawrence R. Schreiber and technician Harold V. Main of the ARS Shade Tree and Ornamental Plants Laboratory in Delaware, Ohio.

In March and April, a time of the year when bud grafts are generally unsuccessful, Dr. Schreiber and Mr. Main successfully used 1-year-old dormant twigs, 2 to 5 inches long, removed with a bark shield of sufficient size to be grafted. They inserted the bark shield into a T-slit in the root stock and wrapped it with rubber banding. The plants were placed in a greenhouse under fluorescent lighting. Once dormancy was broken, the researchers loosened or removed the banding.

Other ornamental trees upon which the twig technique might prove useful are hawthorne, hornbeam, birch, and willow. Dr. Schreiber says that the twig technique could even be used on trees that are usually budded if grafting buds are not available. □



Dr. Ruth M. Leverton (0172K20–29)

Dr. Frank G. Viets, Jr. (0472X589–8).

SCIENTISTS HONORED

For their outstanding achievements, 12 individuals and two groups of ARS employees recently received Distinguished and Superior Service Awards.

Secretary of Agiculture Earl L. Butz presented the awards at USDA's 26th annual awards ceremony held May 23 in Washington, D.C.

for Distinguished Service

Ruth M. Leverton, Science Adviser to T. W. Edminster, ARS Administrator, for leadership, judgment and representation of USDA in public programs concerning domestic and international nutrition problems.

Frank G. Viets, Jr., Soil & Water, for national and international research on the mineral nutrition of plants, soil fertility, and agricultural pollution abatement practices.

Regional Poultry Research Laboratory, Animal Science, for developing a highly efficient, safe vaccine for controlling Marek's disease (avian leukosis).

for Superior Service

William G. Chace, Jr., and **Russell H. Hinds, Jr.,** Market Quality and Transportation & Facilities, for establishing a marketing research facility and program in Europe which provides vital technical assistance in exporting U.S. agricultural products.

Members of the team that developed the Marek's disease vaccine include; **Far right:** *Dr. Ben R. Burmester, Investigations Leader (BN–39179).* **Left:** *Dr. Richard L. Whitter (BN–39177). Group picture (left to right) : Dr. H. Graham Purchase, Howard A. Stone, Dr. Lucy F. Lee, Dr. John J. Solomon, Dr. Jagdev M. Sharma (a new team member), Dr. Keyvan Nazerian, and Dr. William Okazaki (BN–39178).*

Leon W. Coles, Entomology, for contributions to the successful biological control of the alfalfa weevil in the mid-Atlantic States and for successful efforts to extend this benefit to alfalfa producers elsewhere.

Robert A. Fast, Agricultural Research Center Division of Operations, for outstanding contributions to management effectiveness and environment improvement in landscaping the National Agricultural Library and upgrading the landscaping at the Agricultural Research Center.

James L. Fouss, Soil & Water, for significant scientific and technological developments in subsurface drainage materials and installing techniques.

Wilda H. Martinez, Southern Marketing and Nutrition, for creative research on preparing protein isolates and concentrates from cottonseed flour and for leadership in promoting industrial interest in their production and food use.

Walter Mertz, Human Nutrition, for pioneering research in demonstrating the essentiality of dietary chromium, and in identifying the major health benefits of this trace element.

Michael J. Pallansch, Eastern Marketing and Nutrition, for leadership in developing new dry dairy products including spray dried skim milks, wheys, whey-soy blends and whole milks with superior marketable characteristics.

Louis P. Reitz, Plant Science, for leadership in wheat research and wheat improvement.

Joseph W. Simons, Agricultural Engineering, for developing the surface bonding technique for improving housing—particularly for rural families.

Alfalfa Leaf Protein Unit, Western Marketing and Nutrition, for conceiving, developing, and guiding to commercial use, an alfalfa wet fractionation process, resulting in greater retention of feed values, separation of nutrients for optimum use, and increased product values. □

AGRISEARCH NOTES

Maple pests foiled

MAPLE SEEDLINGS valued at 5 cents each in a nursery can literally grow in value to 90 cents in one season—instead of the usual 3 years—with the help of aluminum foil, a minimum of insecticide, and night lighting with floodlamps.

Maple seedlings usually grow to a height of 1 to 2 feet in the first season when grown out of doors. Experimental procedures used at Beltsville, Md., resulted in growth of maples to maximum heights of 4 to 6 feet in 3 months. The greatest growth followed a combination of treatments.

From midsummer to early fall, ARS horticulturist Henry M. Cathey, agricultural engineers James G. Hartsock and Lowell E. Campbell, and entomologist Floyd F. Smith lighted maple saplings with 20 amber floodlights between 10 p.m. and 2 a.m., nightly. The lights provided illumination of about 10 foot-candles—an amount sufficient to prolong midsummer's peak growing period by several weeks. Maples lighted under this regimen grew 1 to 2 feet taller than those in unlighted plots.

Amber lights represented a compromise between opposite ends of the light spectrum—blue vs. red wavelengths. The blue, present in conventional incandescent lamps, promotes photosynthesis—manufacture of food in plant tissue—but also attracts insects. Red wavelengths do not attract night-flying insects, but do stimulate plant growth.

The scientists also placed 0.015-mil aluminum foil sheets 2 feet around the base of some of the maples. The foil reflected light which repelled the potato leafhopper—a pest of more than 100 kinds of plants. Leafhoppers stunt new growth and cause leaf yellowing and reddening called "hopper burn."

In an adjacent group of maples, the scientists applied about 1/8 gram of disulfoton insecticide per seedling. The insecticide was taken up into the leaves and stems through the roots, killing leafhoppers feeding on the foliage. Disulfoton is registered for use against leafhoppers on ornamental shrubs and trees.

Dr. Smith released 80 leafhoppers in the center of each plot, where the insects had equal access to saplings protected by foil alone, to foil plus disulfoton, and to unprotected maples. Most of the leafhoppers settled on unprotected maples, which consequently grew less than 1 inch in five months—under either lighted or unlighted conditions.

In the same period, maples grew to maximum heights of 5 to 6 feet when protected by both foil and disulfoton in plots lighted at night, and 4 to 5 feet in unlighted plots. Saplings protected by foil alone grew to a height of 4 to 5 feet in lighted plots, and 3 to 4 feet in unlighted plots.

UNITED STATES GOVERNMENT PRINTING OFFICE
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Nailing down the joint

ONSITE CONSTRUCTION of wooden trusses and frames for buildings may be improved by a recently developed nailing technique.

Ordinarily, trusses and frames are assembled by putting the structural components into a jig and nailing on a gusset—a brace for reinforcing the joint—after glue has been spread on the pieces. The frame or truss is then turned over and a gusset is nailed to the other side.

The technique is satisfactory for small units, but it becomes more difficult when spans of 30 feet or more are used. Not only are the units hard to turn, but the half-finished joint sometimes is loosened or broken during turning.

To combat these problems and to eliminate some of the labor in making trusses and frames, agricultural engineers Elmon E. Yoder, ARS, and John N. Walker, Kentucky Agricultural Experiment Station, Lexington, nailed both gussets on at once with the aid of a steel clinching plate.

By placing the plate beneath the unit with both glued gussets in place and by using longer nails, the engineers were able to make the joint without sacrificing strength. The plate mushrooms the nail tip for a satisfactory clinch when either hand or power-driven nails are used.

Leaner summer diets for birds

INCREASED DEPENDENCE on fat as a source of dietary energy for broilers results in higher mortality from heat prostration.

When summer temperatures approach 100° F., losses of birds due to heat prostration may become a big economic problem for the broiler producer, especially since these losses usually occur just before marketing.

ARS animal scientists Leon F. Kubena, James W. Deaton, and James D. May and ARS agricultural engineer Floyd N. Reece, State College, Miss., studied the effects of dietary energy source on 8-week-old male broilers. Past reports have indicated that males are more susceptible to heat prostration than females.

For 4 to 8 weeks before the experiments began, broilers were fed constant energy diets containing either 1 or 7 percent added fat as the dietary energy source.

In three trials, temperatures were increased from 70° to 105° F., over a 6-hour period. This temperature was held for 2 hours, then decreased to 80° F. over a 30-minute period.

During the first 30 minutes after the temperature reached 105° F., there was no mortality, but during the second 30-minute period, higher mortality occurred in birds receiving the 7 percent fat level. Higher mortality also occurred in these birds during the third 30-minute period. There were no significant differences in mortality during the rest of the trials.

Weighing antidiuretic effects

AN experimental antidiuretic agent called diazoxide could prevent weight loss in animals under stress during shipping and marketing, but the intended benefits could go awry when insecticides enter the picture.

This antidiuretic has been used on livestock only experimentally. Canadian scientists prevented weight loss in lambs and pigs with diazoxide. However, ARS veterinary medical officers Harry E. Smalley and Rudy D. Radeleff found in tests at College Station, Tex., that pigs became more susceptible to the toxic effects of insecticides after the animals had been given diazoxide in their feed or in capsules. In contrast, the scientists discovered no adverse effects in similar tests with sheep.

In pigs, the minimal toxic dose of carbaryl is 1,000 milligrams (mg.) per kilogram of body weight of the animal. However, the same toxic effect resulted after a dose of only 50 mg. of carbaryl when the pigs had been fed diazoxide—a twentyfold increase in toxicity of the insecticide. Toxicity of benzene hexachloride increased about threefold. Toxicity increased only slightly in tests with dimethoate.

The tested materials are representative of the three major classes of insecticides: carbamates, chlorinated hydrocarbons, and organophosphates. When properly used on livestock, the tested insecticides are nontoxic to the animals, but when diazoxide is administered the toxicity of the pesticide can be increased, as shown by Drs. Smalley and Radeleff. The scientists administered diazoxide at doses of 20 or 40 mg. per kilogram of animal body weight.

U. S. GOVERNMENT PRINTING OFFICE : 1972 O - 466-657